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Success Indicators and Soviet Enterprise Performance

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Abstract

This paper reviews what is known about Soviet management incentive problems by analyzing the structure and performance of recent success indicators. The purpose of the paper is to facilitate the development of a questionnaire to administer to former Soviet enterprise management personnel. Such a questionnaire will enable us to determine the impact of recent reforms on the specification and performance of enterprise management success criteria. Furthermore, information gained from this project will shed additional light on enterprise-level technological innovation processes because the decision to innovate or adopt innovations is largely determined by the bonus structure. These two aspects of the management interview project are part of a larger study of the Soviet economic bureaucracy which focuses on the organization and operation of the industrial enterprise.

Success Indicators and Soviet Enterprise Performance

Success indicators are measures of enterprise performance which are used to determine management bonuses in Soviet enterprises and production associations. They act to influence managerial behavior with respect to gross output, production expenditures, product mix, input utilization, sales, and quality. Substantial effort has been directed toward devising success indicators or incentive schemes which i) induce firms to act efficiently in carrying out plans, ii) motivate managers to send accurate information to central planners, and iii) place a minimal administrative burden on central planners. In spite of several reforms since 1965 which directly addressed success indicator issues, however, there still exists an incentive problem in the USSR. That is, enterprise managers are not motivated to produce efficiently or transmit accurate information regarding productive capacity.

This paper reviews what is known about Soviet management incentive problems by analyzing the structure and performance of recent success indicators. The purpose of the paper is to facilitate the development of a questionnaire to administer to former Soviet enterprise management personnel. Such a questionnaire will enable us to determine the impact of recent reforms on the specification and performance of enterprise management success criteria. Furthermore, information gained from this project will shed additional light on enterprise-level technological innovation processes because the decision to innovate or adopt innovations is largely determined by the bonus structure. These two aspects of the management interview project are part of a larger study of the Soviet economic bureaucracy which focuses on the organization and operation of the industrial enterprise.

Part I identifies what is generally known about Soviet success indicators by examining various bonus structures, the economic environment in the USSR of taut planning and input supply uncertainty, and the dysfunctional managerial behavior resulting from these factors. Reforms introduced in 1965, 1971, and 1979 have all addressed the dysfunctional aspect of managerial behavior by adopting new success criteria. These are analyzed in Part I in light of the proposed and actual impact on enterprise-level decision-making. Part II examines several theoretical models proposed by Western economists to resolve Soviet success criteria problems. Underlying these models are numerous hypotheses which may be tested in the course of the enterprise management interview project. Part III offers a summary of the themes to be stressed in the management questionnaire.

I. Success Criteria and Managerial Incentive Schemes

Success criteria are rules established by central planning authorities to determine and evaluate plan fulfillment. In the past, their number has varied, including such indicators as gross output, sales, production expenditures, labor or material utilization, and productivity. Incentive systems consist of reward or bonus structures associated with particular success criteria. Normally, bonuses are differentiated across success criteria according to planners' priorities. Soviet enterprise managers are depicted as bonus-maximizers, although there is still some debate whether their behavior is short- or long-run oriented. At any given time, a number of alternative decisions face Soviet enterprise managers, even under the system of central planning. Planners must therefore design a set of rules (success criteria) and a system of rewards (bonus structure) to elicit from enterprise managers those activities and outcomes consistent with the planners' goals. Indeed, the Soviet incentive

problem would be eliminated if a set of rules were established which promoted unity between the interests of central planners and enterprise managers. The incentive problem stems from a situation where central planners rely on enterprise managers to supply complete and accurate information regarding production capabilities. Enterprise managers in turn are evaluated on the basis of production performance and, depending upon the success criteria and bonus structure, may or may not be motivated to supply accurate information or produce efficiently.

In addition to success criteria and bonus structures, managerial decision-making is affected by two distinct aspects of the Soviet economy: "taut" planning and input supply uncertainty. This section analyzes the impact these two conditions, combined with the set of rules and rewards, have on enterprise management behavior. As will be demonstrated, this scenario has important consequences for technological innovation at the enterprise level.

The combination of taut planning[1] and perpetual shortage of supplies constitutes the most salient facts of life for Soviet enterprise managers. The economic implications of taut planning have been analyzed by numerous authors, most notably Berliner (1957, 1976), Levine (1959, 1974), and Portes (1969). Linz and Martin (1982) have developed a model designed to examine the combined effect of taut planning and uncertain input supply on the behavior of the

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[1]Planning is said to be taut (Portes 1969, p. 208) when input allocations are less than or equal to the optimal amounts of the inputs that would be chosen, given the minimum profit plan, and when the enterprise cannot obtain the allocated input from secondary sources, such as the black market. From the central planners' perspective, tautness is highly desirable in the resource allocation mechanism since it should prevent hoarding of allocated inputs in one sector while another sector goes begging for the same input. Combined with the bonus system, however, taut planning induces enterprise managers to make certain types of decisions that are contrary to the interest of central planners.

enterprise manager in the planning-production process. Our results imply that Soviet enterprise managers, regardless of attitudes toward risk, request larger quantities of the centrally allocated input under conditions of taut planning and supply uncertainty than they actually require to produce the targeted level of output. As a result, resource allocation is distorted as Soviet managers attempt to ensure a "safety factor" and production is often impeded as bottlenecks arise in response to supply shortages. Bergson (1964), Berliner (1957, 1976), Feiwel (1965), and Kornai (1959, 1980) cite a number of economic consequences that aggravate the problem of scarcity of the controlled input and further complicate resource allocation and production under input-supply uncertainty. These include stoppages and fluctuations of production,[2] lower standards of quality, production of unplanned products, falsification of reports, and employing expeditors (tolkachi) to supply the enterprise with materials at any cost, legal or otherwise.

An important component underlying managerial response to these two aspects of the Soviet economic environment are the success criteria and bonus structures established by central planning authorities to determine and evaluate plan fulfillment. The most widely used incentive structure is one in which quotas are set by central planners for production agents (firms or managers) and the agents' rewards are based on fulfillment or overfulfillment of these quotas. Pre 1965 reform quota-bonus incentive schemes have been modeled by Ames (1965) and Ellman (1971). These reward functions specified that each manager received i) a base wage, ii) a lump-sum bonus for fulfilling the quota,

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[2]Production smoothing under a system of centrally allocated inputs can be a very difficult task, as delays in delivery of critical allocated inputs can cause unscheduled work stoppages. Berliner (1957) estimates that such delays in delivery amount to 30% of all work stoppages.

and iii) an incremental bonus for quota overfulfillment.[3] As modeled by Ames, the enterprise manager was only constrained to cover production costs, hence the firm could produce any output such that P > ATC. Under this scheme, agents maximized their rewards by producing the largest feasible output. Although this scheme appears to be output-maximizing, it did not motivate managers to transmit accurate information. Rather, this quota-bonus scheme acted as a prevailing motivation for managers to understate their true productive capacity because bonuses were paid only if production targets were overfulfilled. If the manager honestly reported full production capacity, and something went wrong which halted production, all managerial personnel (and workers) lost the month's bonus. It was much safer therefore to report a smaller capacity to keep production targets low enough to allow for emergencies.[4] As a consequence, under pre 1965-reform incentive schemes, planners were never sure plans were based on accurate information. Planner reaction to perceived inaccurate information from enterprise managers was to set arbitrarily high plan targets to force firms to operate as close to capacity as possible. The extent to which deliberate overplanning is still practiced needs to be investigated.

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[3] In this case the reward function can be written as

$$R_i = W_i, \text{ if } X_i < \overline{X}_i$$

$$= W_i + B_i + b(X_i - \overline{X}_i), \text{ if } X_i > \overline{X}_i$$

where R_i = reward for firm i, W_i = base wage, X_i = current production, $\overline{X}_i$ = quota/targeted production, B_i = lump-sum bonus for quota fulfillment, and b = incremental bonus coefficient for overfulfillment.

[4] Indeed, Ames (1965) demonstrates that existing incentive structures were not optimal because managers could always benefit by transmitting inaccurate information, i.e., by misrepresenting production capacities.

The 1965 reforms did little to change the quota-bonus structure of existing incentive schemes. Rather, success criteria adjustments were made by substituting probability or sales for gross output as measures of plan fulfillment. An excellent discussion of the 1965 economic reforms is found in Gregory and Stuart (1981). Ellman (1971) provides an algebraic characterization of the bonus formulas incorporated in the 1965 reforms. Overall, the 1965 reform was unsuccessful in specifying success criteria which motivated managers to transmit accurate information and produce efficiently. The dysfunctional behavior described by Berliner, Kornai, and others remained the norm.

Post 1965 reform incentive structures have been modelled by Bonin (1976), Ellman (1973), Weitzman (1976), Loeb and Magat (1978) and others. Weitzman offers the most general formulation[5] of the success indicators utilized in the 1971 reform. The elicitation scheme described by Weitzman differs from quota-bonus schemes in at least two respects. Under the post 1971 elicitation incentive structure, forecasts, or self-imposed quotas, are submitted by enterprise managers to central planners and this expected output information is transmitted on the basis of some planner-specified probability.

To put the 1971 reform and the success indicator issue into perspective, it is useful to initially consider the planning-production process as a three-stage static problem. In stage 1, the period of early negotiation and plan formulation, central planners assign to each firm a tentative output target, q^o, and a bonus target, $\overline{B}$. The firm is also faced with bonus/penalty coefficients, α, β, γ, where $0 < \alpha < \beta < \gamma$. In the second stage, the actual

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[5] Loeb and Magat (1978) demonstrate that the success indicators modelled by Ellman (1973) and Fan (1975) are subsets of the Weitzman formulation.

planning stage, each firm chooses a plan target based on its forecasted output level, q^f. The firm's forecasted target need not equal the initial plan target chosen by the planners. In Stage 3, the period of plan implementation or production, the enterprise produces some level of output, q^a (not necessarily equal to its forcast, q^f), and is rewarded on the basis of a success indicator:

$$S(q^f,q^a) = \hat{B} + (\beta-\gamma)q^f + \gamma q^a, \text{ if } q^a \leq q^f$$

$$= \hat{B} + (\beta-\alpha)q^f + \alpha q^a, \text{ if } q^a > q^f$$

where S = total bonus received, q^f = forecasted output level, q^a = actual output level, $\hat{B}$ = lump-sum bonus[6] and $0 < \alpha < \beta < \gamma$. Within the static framework, managers are assumed to maximize the current bonus derived from the success indicator and central planners to adjust the bonus/penalty coefficients to induce managers to report output levels achievable with some pre-specified degree of reliability.

In a dynamic framework, planners are assumed to use current performance to revise the bonus/penalty coefficients (α, β, γ) of future success indicators and managers to maximize the time-discounted sum of current and future bonus values. It is possible to analyze the "ratchet effect" problem inherent in pre 1971 success indicators within the dynamic framework. That is, if q^a exceeds

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[6]Alternatively, this component of the bonus may be interpreted as incorporating the early negotiation stage and written as

$$\hat{B} = \overline{B} + \beta(q^f-q^o)$$

where $\overline{B}$ = bonus target and q^o = planners' tentative output target. In this case the success indicator would be written as:

$$S(q^f,q^a) = \hat{B} + \alpha(q^a - q^f), \text{ if } q^a \geq q^f$$

$$= \hat{B} - \gamma(q^f - q^a), \text{ if } q^a < q^f.$$

q^f in any given period, planners will increase q^o in the next period as a penalty for excessive overfulfillment, thereby obliging firms raise their own forecasts (although not necessarily by an identical amount), and making it hard to earn bonuses in following periods.

An important aspect of the 1971 reform was the attempt to eliminate the ratchet effect. Indeed, the reform froze planner-determined output and bonus targets for 5 years, and similarly constrained bonus/penalty coefficients for the same period. As a result, the success indicator, S, is respecified as:

$$S(q^f,q^a) = \overline{B} + \beta(q^f - q^o) + \alpha(q^a - q^f), \text{ if } q^a \geq q^f$$

$$= \overline{B} + \beta(q^f - q^o) + \gamma(q^f - q^a), \text{ if } q^a < q^f$$

where $\overline{B} \geq 0$, $q^o \geq 0$ and $0 < \alpha < \beta < \gamma$. In this scheme where q^f affects S but not necessarily q^a (i.e., firm forecasts do not influence input allocations) and if perfect certainty about production is assumed, then firms are motivated to send truthful information to central planners. That is, they will transmit accurate forecasts because they are in no way penalized by sending accurate information and, in fact, can only benefit from doing so under this success indicator specification. In addition, managers will strive to increase actual output as much as possible so as to maximize their bonus.

The problem with this success indicator is that it neither allows nor explains how q^f affects planning decisions or supply allocations, especially when more than one enterprise is considered. In the usual case, an individual firm's forecast, q_i^f, affects not only its own capital allocation, k_i, but every other firm's allocation as well, since the total capital available, $\overline{K}$, is fixed during any given period. One would suspect that in this case, managers may

tend to arbitrarily boost their forecast, q_i^f, to increase their capital allocation, k_i, thereby allowing for a greater potential increase in actual output, q_i^a, and hence a higher reward or bonus. In short, this success indicator, under the conditions just described, still motivates managers to provide inaccurate information to central planners in order to affect their capital and input allocations. As such, the 1971 reform has not resolved the problem of designing a rule whereby managers are motivated to send accurate information to central planners.

A number of Western economists have addressed the theoretical aspects of the Soviet success indicator issue since the 1971 reform, most notably Keren (1972), Weitzman (1976), Loeb and Magat (1978), Conn (1979), Miller and Thornton (1978), Bonin and Marcus (1979), and Holmstrom (1982). These models and their underlying hypotheses will be examined in Part II. An important contribution to be made of this aspect of the enterprise management study will be in testing several of these hypotheses and examining the impact of the 1971 reform on managerial behavior.

The recent (July 1979) reform of success criteria and bonus structures indicates a failure of the 1971 reform to achieve desired results, that is, to promote a unity of interests between central planners and enterprise managers. By all indications, the New Soviet Incentive System adopted in 1971 failed to motivate managers to supply accurate information or produce efficiently. As a result, the 1979 decree specified three new success criteria as the basis for evaluating enterprise plan/target fulfillment: i) labor productivity, ii) quality mix, and iii) fulfillment of delivery plans according to supply contracts. Three other modifications of the planning process were also included in the recent decree: i) using "normative net output" instead of

gross output or sales; ii) continuing (a modified version of) the system of counter-planning introduced in 1971;[7] iii) assessing plan fulfillment on a cumulative basis over each year, so that if a firm experiences underfulfillment in any given quarter, it can be "made up for" in a later quarter. Hanson (1983) offers an excellent discussion of how these success criteria and planning changes are supposed to work and the problems inherent in the changes. While it will not be possible to question former management personnel specifically about the 1979 reforms (most respondents arrived shortly before or after the decree was announced), it will be possible to address general issues involved in the reform. For example, questions may be included regarding i) enterprise self-assessment of output quality, ii) manager evaluation of "net normative output" as an improved measure of plan fulfillment, iii) the use of cumulative assessment as a means of reducing incentives to hoard "hidden reserves" or increasing incentives for improved maintenance and/or retooling. Clearly, these (and other similar) questions could only be pursued successfully if the respondent was familiar with the decree. The principle of counter-planning, however, is an area where significant gains in information can be made.[8] To

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[7] Under the 1971 system of counter-planning, each firm received stable Five-Year Plan targets for each year. The firms were then invited to set new, higher annual targets to increase their bonuses higher than originally specified.

[8] Counter-planning was adopted in 1971 to overcome tendency to hoard hidden reserves. Under counter-planning, the enterprise stands to gain a larger annual bonus by volunteering and fulfilling a higher counter-plan in any given year than it would by not adopting a counter-plan and simply overfulfilling its basic plan sufficiently to arrive at the hypothetical counter-plan performance level. Counterplanning has desirable incentive properties, even under conditions of uncertainty (as Weitzman, 1976, has demonstrated). If the counter-plan affects the firm's input allocation, however, these desirable incentive properties are lost. It will, therefore, be important to determine from this study which is the case.

what extent did counter-planning affect output levels? How often were counter-plans submitted? Did counter-plans always involve higher targets?

Taut planning, uncertain input supply, success criteria and bonus structures are important factors influencing Soviet managerial decision-making. One area where this is especially pronounced is with respect to enterprise-level innovation processes. On the one hand, the absence of rational changes for the use of capital motivates Soviet managers to over-order fixed capital and hoard machinery and equipment. On the other hand, management incentive systems have discouraged enterprise directors from taking risks associated with technological (as opposed to organizational) innovation, or the introduction of new, large-scale production techniques. This phenomenon is well documented by Berliner (1976), Amann and Cooper (1982) and others. An important contribution to be made by this study involves a comparison of their findings (based on information derived from "priority" industries) with information generated on the basis of interviews with managers from "non-priority" industries. Are these managers faced with similar planning and supply problems, and a similar reward structure to act against technological innovation? Are smaller scale enterprises more likely to innovate, despite the absence of direct pressure to do so from above?

II. Modeling Success Indicators and Mangerial Behavior

The incentive problem in the USSR can be likened to a game in which firms are motivated by success indicators to play strategies consisting of forecasts (information supplied to central planners) and operating decisions. The question currently facing Soviet authorities is whether recently designed success indicators continue to encourage the transmittal of inaccurate information

as suggested in Part I. Success indicators have been modeled by Ellman (1971, 1973), Weitzman (1976), Loeb and Magat (1978), Miller and Thornton (1978) and others. This section will examine a variety of the success indicator models and their implementations for Soviet planning and production practices.

An easy way to categorize the numerous recent success indicator models involves enterprise involvement in the planning process. Most of the models assume that the firm's actions (forecasts, or counter-plans) have no direct bearing on input allocations. See, for example, Miller and Thornton (1978), Conn (1979), Bonin and Marcus (1979), and Weitzman (1976). Loeb and Magat (1978) allow for enterprise involvement in the planning process by proposing an "incentive compatible" success indicator which purports to motivate enterprise managers to transmit accurate information and undertake efficient production behavior, i.e., their model solves the Soviet incentive problem. The enterprise management study has the potential to contribute significantly to this literature by examining the extent of enterprise involvement in the planning process. In addition, it will be possible to include questions regarding managerial effort and output levels to test some of the hypotheses implicit in Miller and Thornton, and Bonin and Marcus.

Since the primary distinguishing feature of these success indicator models involves the role of the enterprise in the planning process, it will be useful to first examine this aspect of the planning-production process. To do so, the incentive compatible model is presented in an intuitive manner.

Assume first that central planners use the firm's forecasts, q_i^f, to allocate available capital, $\overline{K}$. Clearly $q_i^a = f(k_i, l_i)$, and if a corresponding success indicator is designed such that the bonus increases as q^a increases, firms will want to maximize q_i^a. Secondly, assume that planners allocate $\overline{K}$ by

selecting $k_1, k_2, \ldots k_n$ to maximize $\sum_{i=1}^{n} q_i^f(k_i)$, where n = the number of firms and $k_i \leq \overline{K}$, $k_i \geq 0$. In effect, the individual firm's capital allocation, k_i, depends upon all of the enterprises' forecasts, $\hat{k}_i = k_i(q^F)$, where $q^F = q^F(q_1^f, q_2^f, \ldots, q_n^f)$. In this case, the corresponding success indicator would appear to suggest that managers receive bonuses on the basis of actual output, but actual output depends upon the firm's capital allocation which in turn depends upon the enterprise's forecast. In fact, the appropriate success indicator is a function of both forecasted and actual output levels. To clarify this point, consider only those success criteria which are increasing in q_i^a. The problem then is to chose an optimal success indicator, S, remembering that we are first considering the case where the firm has perfect knowledge over q_i^a, and is rewarded solely on the basis of the success indicator. The optimal success indicator should be designed so as to motivate the firm to send q_i^a as its forecast (making S "message desirable"), and should allow for the bonus to increase as actual output increases (making S "operationally desirable"). If both parts hold, the firm cannot independently gain by reporting inaccurate information (i.e., sending incorrect forecasts).

The success indicators modelled by Ellman, Weitzman and others, however, allow for the individual firm to gain by sending biased information because the higher q_i^f, the greater k_i, and hence potential q_i^a. Moreover, as it currently stands, central planners have no way of finding out whether inaccurate information is being transmitted. Loeb and Magat therefore apply the incentive compatible literature to the Soviet success indicator problem to overcome the

shortcomings inherent in the existing rules.[9] The incentive compatible success indicator is specified as

$$S_i(q_i^a, q^F) = q_i^a(\hat{k}_i) + \sum_{i \neq j} q_j^f(\hat{k}_j) - A_i$$

where $k_1, k_2, \ldots, k_n$ are determined on the basis of q^F, $\overline{K}$ is allocated to maximize q^F, and where A_i depends upon every other firm's q^f. In essence, the success indicator awards a bonus to firm i on the basis of realized or actual output, plus the sum of all firms' forecasted output levels, minus some lump-sum amount. To understand why the incentive compatible success indicator is deemed superior, it is necessary to understand the role that A_i plays in the indicator.

A graphic interpretation of the incentive compatible success indicator is given in Figure 1. Assume there are only two managers, i and j. Manager i's actual output function q_i^a is assumed to be the same as manager j's forecasted

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[9] Incentive compatible success indicators have the following three properties: (a) there exists a centralized decision-making mechanism (e.g., the CPB) which determines how some commodity (e.g., the capital stock, $\overline{K}$) is going to be allocated among a set of consumers or producers (e.g., plant managers) so as to maximize reported net benefits (e.g., forecasted output); (b) the centralized mechanism then transfers to each agent (firm/manager) the reported net benefits of all others given the allocated quantities (e.g., in this case, the total output forecasted by all j managers is added to manager i's success indicator); and (c) each agent (firm/manager) is then taxed (or subsidized) in a lump-sum fashion, an amount which is calculated independently of the agent's own actions.

Of the three properties above, property (a) is the most important. It is this property which ensures that the dominant strategy of each agent is to reveal information truthfully. In most cases, however, an incentive compatible scheme of this sort will result in a particular pattern of income distribution which may be deemed "inequitable" (because of property b). Hence, property c is really a device to redistribute income, and can be set up in an arbitrary manner. Since this redistributive device is administrered in a lump-sum fashion, it cannot possibly affect any agent's strategic decision-making. In this sense, property c may be viewed as not an inherent part of any incentive compatible scheme.

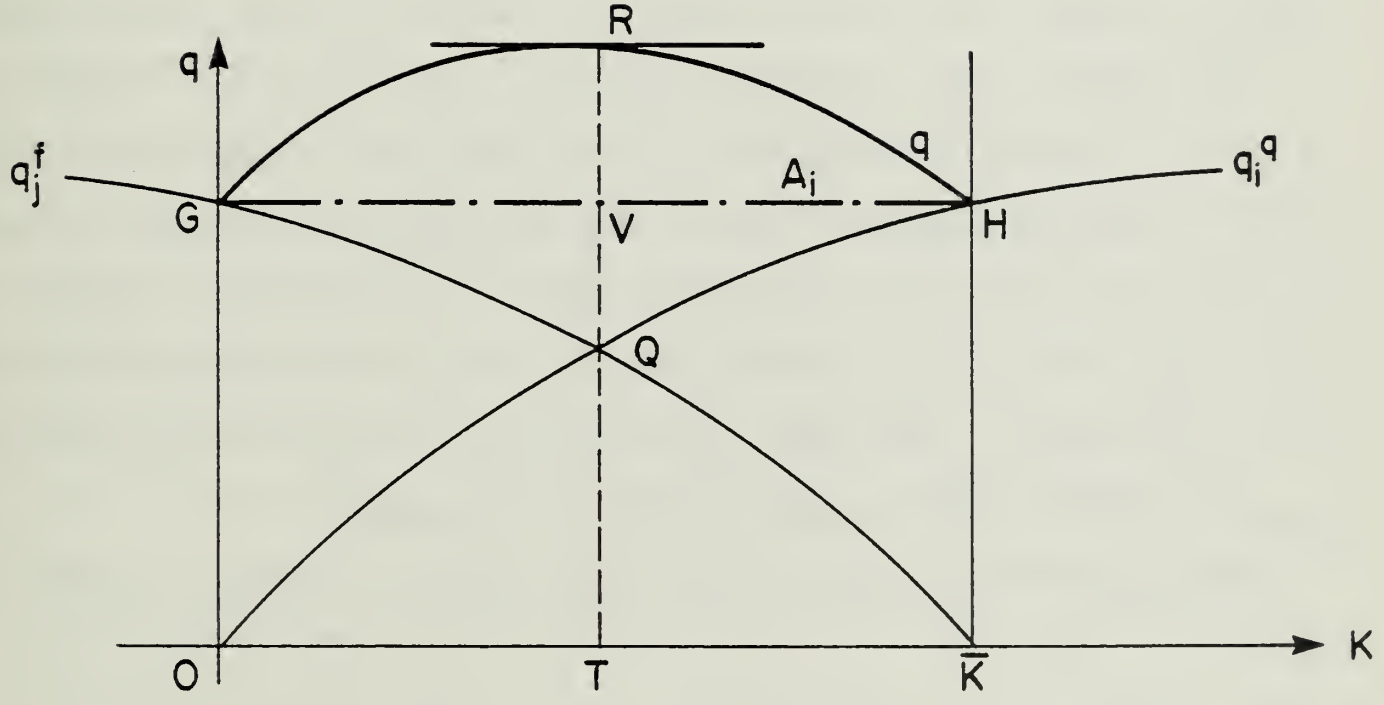

FIGURE 1

output function, q_i^f (this assumption does not in any way affect the generality of the analysis, it is made for graphical convenience). The total available capital stock is $\overline{OK}$. If the entire amount is allocated to i, actual output from i would be $\overline{HK}$. The forecasted output function of j is drawn using $\overline{K}$ as the origin, so that if the entire $\overline{OK}$ is allocated to j, OG would be the forecasted output from j. By assumption, q_i^f and q_i^a are identical, hence $OG = \overline{KH}$. Suppose i reveals truthfully its output function (i.e., it reports q_i^a as its forecast function to the central planners), then the CPB would allocate capital by maximizing $q = q_i^a(k_i) + q_i^f(k_j)$. Graphically, the total output function can be gotten by vertically adding the q_i^f and q_i^a curves, so it must begin at G and end at H, reaching a maximum (point R) directly above the intersection (point Q) of the q_i^f and q_i^a curves. This holds because at Q the slopes of q_i^f and q_i^a are equal. Clearly the solution for the planners is to allocate OT of capital to i and $\overline{KT}$ to j. Note that, by construction, $OT = \overline{KT}$, so that the entire capital stock is equally divided between the two managers.

The incentive compatible structure then defines the success indicator for i as

$$S_i = q_i^a + q_j^f - A_i$$

where A_i is the maximum of q_j^f. It is obvious from the diagram that $q_i^a = QT$, $q_j^f = QT$, and $A_i = OG$. Hence

$$\begin{aligned} S_i &= QT + QT - QG \\ &= RT - QG \\ &= RT - VT \\ &= RV. \end{aligned}$$

What is the economic interpretation of RV? It is the social opportunity cost of not having i, because had i been absent, the entire capital stock would have been allocated to j and the resultant total output would have only been OG. RV measures the net contribution from i. Hence, by defining A_i in the particular way above, the success indicator directly measures the net social contribution of a manager.

The above analysis was carried out under the assumption that i reports truthfully q_i^a. Is there an incentive for him to do so? The answer is clearly yes, because revealing q_i^a is his dominant strategy--no other strategy would make him better off. To see this, suppose i reports q_i^f which is above q_i^a, i.e., $q_i^f > q_i^a$. Figure 2 reproduces the first graph and includes the q_i^f curve. The reported or forecasted total output function must now start at G, end at W, lie everywhere above the old one, and reach a maximum to the right of R, say at R'. Note again that R' must be directly above the points of equal slopes on the q_i^f and q_j^f curves (points A and B respectively). Central planners base their capital allocation decision on q_i^f and q_j^f. Hence OT' amount of capital is allocated to i this time with only $\overline{K}'$ allocated to j. As a result, i's action of overforecasting causes more capital to be allocated to him. However, this actually makes him worse off than before. To see this, note that with OT' amount of capital i's actual output is Q'T', while j's forecasted output is BT'. In this case, i's success indicator is

$$\begin{aligned} S_i &= q_i^a + q_j^f - A_i \\ &= Q'T' + BT' - OG \\ &= IT' - OG \\ &= IT' - JT' \\ &= IJ \end{aligned}$$

and $IJ < RV$.

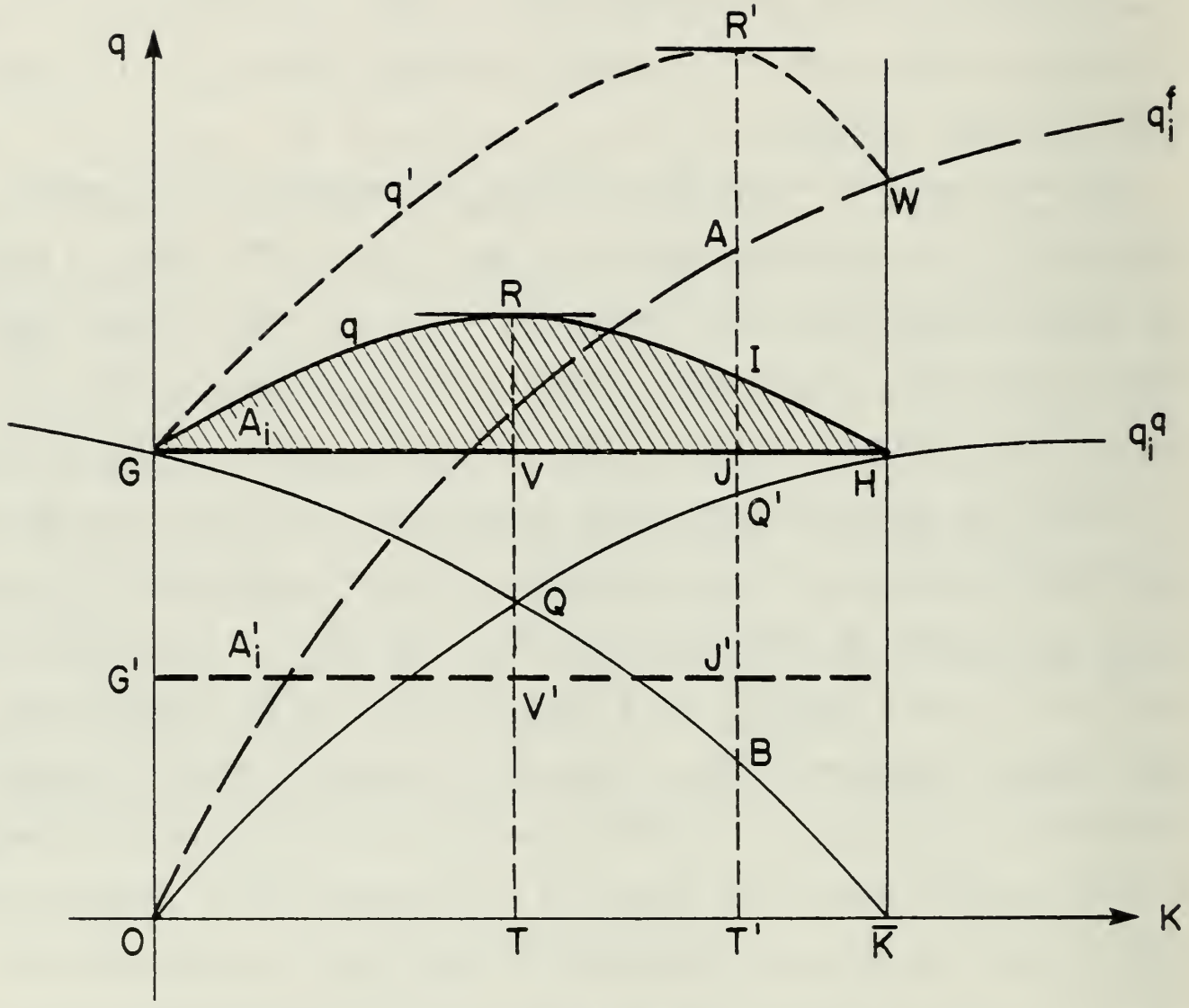

FIGURE 2

Similar analysis will show that if i underforecasts his output, he will again be worse off than if he reveals truthfully q_i^a.

It should be clear that the incentive for i to reveal q_i^a truthfully is not altered even if A_i is defined differently (although A_i must remain a lump-sum configuration and independent of i's action). For if we now define $A_i \neq OG$, but $A_i = OG'$, we see that if i reveals q_i^a, his success indicator would be RV'; but if he reports q^f, his success indicator would be IJ', and IJ' is less than RV', so he is again worse off by overforecasting. Of course, if A_i is defined by OG' and not OG, the nice interpretation of the success indicator (i.e., that it measures the opportunity cost of not having the manager or the net contribution of the manager) is lost, but by no means has the incentive to reveal truthfully one's output changed. For this reason A_i can be defined arbitrarily as Loeb and Magat state (p. 179), but obviously it is better to define it in such a way so as the resultant indicator (or index) has some clear economic meaning.

If problems associated with defining A_i were resolved, this incentive compatible success indicator would represent, theoretically at least, an improvement over those currently employed in the USSR. It relies, however, on the assumption that firms, after receiving their capital allocations, employ optimizing quantities of labor and other materials. This assumption fails to take into account Soviet employment practices whereby labor is rarely removed from the production process and hence not always employed in optimizing quantities. It will be useful to determine from this study the extent to which these employment policies persist, given labor shortages in most sectors of the Soviet economy.

Miller and Thornton (1978) criticize the applicability of Loeb and Magat's incentive compatible bonus structure in the USSR. Their analysis of the post 1971 incentive system incorporates the effect of managerial effort on output.[10] The applicability and usefulness of their model is contingent upon answers to at least three questions: i) can and do Soviet managers affect input allocations? ii) is the ratchet effect weak or strong? iii) does managerial effort vary significantly when central planners change bonus/penalty coefficients in reward structures? In addition, we need to know more about the nature of the uncertainty faced by Soviet enterprise management, and about the relationship between managerial effort and output.

III. Management Questionnaire Themes

The primary role of the Soviet Economic Bureaucracy (SEB) project is to contribute to the descriptive literature on the structure and performance of the Soviet economy by updating and perhaps revising our current knowledge of how the Soviet economy operates. Of fundamental importance to the SEB project is a special study of the Soviet enterprise, how it operates and what it is like to run a Soviet firm. A study of this sort will enhance our understanding of the Soviet economy by confronting a variety of planning, production, and distribution issues. Interviewing former Soviet management personnel, planners, and party officials, as expert-informants, will enable us to gain an understanding of how the Soviet economic bureaucracy worked in the 1960s and 1970s, and if, how, when, and why it has changed over time.

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[10] Keren (1972) was the first to address the impact of managerial effort on output. In Keren's model, effort affects output by increasing the quality of managerial decisions.

The Soviet enterprise management study incorporates four basic themes: enterprise-ministry relations, innovation and the enterprise, management-labor relations, and managerial motivation and evaluation. To facilitate the development of a questionnaire to be administered to former enterprise management personnel, working papers[11] have been written which review and summarize what is known with confidence, what we think we know, and what is not known about contemporary Soviet enterprise organization and operation. In these working papers, the formal structure of the management system is identified, management practices at the macro- and microeconomic levels are examined, and the impact of the reforms implemented in the 1960s and 1970s on the structure and processes of the management system is analyzed in light of the basic themes this study is investigating. In addition, Soviet management incentive issues are explored in some detail; first to determine the effects of recent reforms on the specification and performance of enterprise management success criteria; and second, to gain additional insight into enterprise-level innovation processes, because the decision to innovate or adopt innovations in the USSR is largely determined by the bonus structure. In each working paper, where appropriate, hypotheses and questions are identified for possible inclusion in the enterprise management questionnaire.

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[11] See also, Susan J. Linz, "Soviet Enterprise and the Management Environment: A Review Essay," Working Paper 14-83, Department of Economics, LSU, August 1983.

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